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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/739,168	12/18/2000	Scott E. Budge	4202.1	3993

24247 7590 06/16/2004

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EXAMINER	
AKHAVANNIK, HUSSEIN	
ART UNIT	PAPER NUMBER
2621	4

DATE MAILED: 06/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	09/739,168	BUDGE ET AL.	
	Examiner	Art Unit	
	Hussein Akhavannik	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☒ Claim(s) *1 and 21* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 February 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 2.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

On page 1, line 33, "may coefficients" should be changed to "many coefficients".

On page 4, line 4, "DISCLOSURE OF INVENTION" should be changed to "SUMMARY OF THE INVENTION".

On page 6, line 9, "BEST MODES FOR CARRYING OUT THE INVENTION" should be changed to "DETAILED DESCRIPTION".

Appropriate correction is required.

Claim Objections

2. Claims 1 and 21 are objected to because of the following informalities:

In claim 1, line 4, "into wavelet domain" should be changed to "into the wavelet domain".

In claim 21, line 2, "reconstructing a zerotree from an encoded image;" should be deleted as it is redundant.

Appropriate correction is required.

Drawings

3. Figure 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated (DPCM encoder and decoder). See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Information Disclosure Statement

4. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

The Applicant is respectfully requested to provide copies of the publications cited throughout the specification.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 19-24 are rejected under 35 U.S.C. 112, first paragraph, because independent claims 19 and 22 recite a single means wherein the means recitation does not appear in combination with another recited element of means (see MPEP 2164.08a).

Referring to claim 20-21 and 23-24, these claims are indefinite depending from an indefinite antecedent base claim.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 19 and 22 are rejected under 35 U.S.C. 102(e) as being anticipated by Beck (U.S. Patent No. 6,134,350).

Referring to claim 19, an integrated circuit is explained by Beck in column 1, line 63 to column 2, line 4 as the JPEG chip. The "coding an decoding an image by rate-distortion adaptive zerotree-based residual vector quantization" is function language that does not change the structure of the single means of an integrated circuit.

Referring to claim 22, a circuit card is explained by Beck in column 1, line 63 to column 2, line 4 as the JPEG chip, which is a mobile hardware device containing a circuit. The "coding an decoding an image by rate-distortion adaptive zerotree-based residual vector quantization" is function language that does not change the structure of the single means of an integrated circuit.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1-2, 9, 11-12, 16, 18, 20-21, and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beck in view of Shapiro (J.M. Shapiro, "Embedded Image Coding Using Zerotree of Wavelet Coefficients," *IEEE Transactions on Image Processing*, vol. 1, no. 2, pp. 205-220).

Referring to claims 1 and 16,

i. Obtaining a digital image is illustrated by Beck in figure 9 by the selection of the entire image 52.

ii. Transforming the digital image into the wavelet domain, thereby generating a pyramid hierarchy is illustrated by Beck in figure 9 by the decomposition in the x-axis and the y-axis 54 and 56, respectively. The pyramid hierarchy is illustrated by Beck in figure 8 by the 3 level wavelet pyramid.

iii. Losslessly encoding a top low-low (LL) subband of the pyramid hierarchy, thereby obtaining a losslessly encoded portion of the digital image is explained by Beck in the abstract and illustrated in figure 11 by the All Others 88. Beck explains that the LL representation in the first wavelet and the LL, LH, HL, and HH representations in the second wavelet (which together comprise the LL representation of the first wavelet as illustrated by Beck in figure 6) are compressed (encoded) on a lossless basis.

iv. Vector quantization (VQ) encoding all other subbands of the pyramid hierarchy, based on a zerotree insignificance prediction, thereby obtaining a lossy encoded portion of the digital image is not explicitly explained by Beck. Beck does explain lossy compressing the LH, HL, and HH representations (corresponding to the all other subbands) in the abstract. Beck further explains that the lossy compression comprises performing a discrete cosine transform (DCT) followed by Huffman coding (VQ) in column 7, lines 1-22. However, Beck does not explicitly explain encoding based on a zerotree insignificance prediction. Shapiro explains that the zerotree wavelet algorithm is a simple and effective image compression algorithm in the abstract. Shapiro also

explains that the zerotree wavelet algorithm does not require training, pre-stored tables or cookbooks, or knowledge of the image source, thereby reducing the optimization time required to perform compression. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform encoding based on a zerotree insignificance prediction, as suggested by Shapiro, rather than encoding based on DCT method, as suggested by Beck, because the processing and/or time required to perform optimized compression will be reduced.

v. Outputting an encoded image from the losslessly encoded portion of the digital image and the lossy encoded portion of the digital image is illustrated by Beck in figure 11, wherein the HL 82, LH 84, and HH 86 regions are output based on lossy encoding and the All Others (corresponding to LL) 88 are output based on lossless encoding.

Referring to claim 2, the transforming the digital image into the wavelet domain comprising a 2-dimensional separable octave decomposition which generates the pyramid hierarchy is illustrated by beck in figure 8, wherein a 3 level wavelet pyramid results in a octave decomposition. A 2-dimensional octave decomposed digital image is illustrated by Beck in figure 6.

Referring to claim 9, the VQ encoding comprises rate-distortion optimization along a threshtree is explained by Beck in column 7, lines 1-22. Beck explains VQ encoding (through a Huffman encoder) by optimization of a threshtree as illustrated by Beck in figure 7 (corresponding exactly to figure 5 of the present application, which describes a threshtree).

Referring to claims 11 and 18,

i. Obtaining the encoded image is illustrated by Beck in figure 11 by the encoded HL 82, LH 84, HH 86, and All Others 88 encoded regions of a digital image that are transmitted to a decompression stage via channels 90, 92, 94, and 96 that together comprise the entire digital image.

ii. Reconstructing a zerotree from the encoded image is not explicitly explained by Beck. However, Shapiro explains determining a zerotree on page 3449, first column, tenth paragraph ("To improve …"). In order to reconstruct a zerotree insignificance prediction wavelet transformed image, corresponding to claim 1iv, it is required to reconstruct the zerotree to accurately reconstruct the digital image. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to reconstruct a zerotree from an encoded image, as suggested by Shapiro, in the decompression stage of Beck because the zerotree insignificance prediction wavelet transformed image will be reconstructed accurately.

iii. Vector quantization decoding subbands in the encoded image other than a top LL subband is illustrated by Beck in figure 10 by the dequantize coefficients stage 110.

iv. Losslessly decoding the top LL subband is illustrated by Beck in figure 10 by the Huffman decode stage 104.

v. Reverse wavelet transforming the top LL subband and the vector quantization decoded subbands is explained by Beck in column 7, lines 40-45 and illustrated in figure 11 by the wavelet reconstruction 98.

vi. Outputting a decoded image from the decoded top LL subband and the decoded subbands other than the decoded top LL subband is explained by Beck in column 9, lines 11-13, wherein the decoded image is output on a display.

Referring to claims 12 and 25,

i. Obtaining a digital image corresponds to claim 1i.

ii. Transforming the digital image into the wavelet domain, thereby generating a pyramid hierarchy corresponds to claim 1ii.

iii. Losslessly encoding a top low-low (LL) subband of the pyramid hierarchy, thereby obtaining a losslessly encoded portion of the digital image corresponds to claim 1iii.

iv. Vector quantization (VQ) encoding all other subbands of the pyramid hierarchy, based on a zerotree insignificance prediction, thereby obtaining a lossy encoded portion of the digital image corresponds to claim 1iv.

v. Outputting an encoded image from the losslessly encoded portion of the digital image and the lossy encoded portion of the digital image corresponds to claim 1v.

vi. Transmitting the encoded image along a communications channel is illustrated by Beck in figure 11 by the transmission of the HL 82, LH 84, HH 86, and All Others 88 encoded image information to the decompression stage.

vii. Obtaining the encoded image transmitted along the communications channel is illustrated by Beck in figure 11 by the channels 90, 92, 94, and 96.

viii. Obtaining the encoded image along the communications channel corresponds to claim 11i.

ix. Reconstructing a zerotree from the encoded image corresponds to claim 11ii.

x. Vector quantization decoding subbands in the encoded image other than a top LL subband corresponds to claim 11iii.

xi. Losslessly decoding the top LL subband corresponds to claim 11iv.

xii. Reverse wavelet transforming the top LL subband and the vector quantization decoded subbands corresponds to claim 11v.

xiii. Outputting a decoded image from the decoded top LL subband and the decoded subbands other than the decoded top LL subband corresponds to claim 11vi.

Referring to claims 20 and 23,

i. Transforming the digital image into the wavelet domain, thereby generating a pyramid hierarchy corresponds to claim 1ii.

ii. Losslessly encoding a top low-low (LL) subband of the pyramid hierarchy, thereby obtaining a losslessly encoded portion of the digital image corresponds to claim 1iii.

iii. Vector quantization (VQ) encoding all other subbands of the pyramid hierarchy, based on a zerotree insignificance prediction, thereby obtaining a lossy encoded portion of the digital image corresponds to claim 1iv.

iv. Outputting an encoded image from the losslessly encoded portion of the digital image and the lossy encoded portion of the digital image corresponds to claim 1v.

Referring to claims 21 and 24,

i. Obtaining the encoded image corresponds to claim 11i.

ii. Reconstructing a zerotree from the encoded image corresponds to claim 11ii.

iii. Vector quantization decoding subbands in the encoded image other than a top LL subband corresponds to claim 11iii.

iv. Losslessly decoding the top LL subband corresponds to claim 11iv.

v. Reverse wavelet transforming the top LL subband and the vector quantization decoded subbands corresponds to claim 11v.

vi. Outputting a decoded image from the decoded top LL subband and the decoded subbands other than the decoded top LL subband corresponds to claim 11vi.

11. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Beck in view of Shapiro, and further in view of Zeng et al (U.S. Patent No. 6,236,757).

Referring to claim 3, the transforming comprising a Daubechies 9-7 symmetric wavelet transform is not explicitly explained by Beck or Shapiro. However, Zeng et al explain that a Daubechies 9-7 symmetric wavelet transform can be used as a discrete wavelet transform (DWT) for effectively coding natural images in column 1, lines 52-63. The Applicant explains in paragraph 37 of the specification that wavelet transforms suitable for performing the DWT include the Daubechies 9-7 symmetric wavelet transform, the Two Six (TS) transform, and the Two Ten (TT) wavelet transform. Therefore, it would have been an obvious matter of design choice to modify the system of Beck and Shapiro by using a Daubechies 9-7 symmetric wavelet transform to transform a digital image into the wavelet domain, since the Applicant has not disclosed that using the Daubechies 9-7 symmetric wavelet transform solves any stated problem or is for any particular purpose and it appears that any DWT would perform equally well.

12. Claims 4-8, 13-15, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beck in view of Shapiro, and further in view of admitted prior art.

Referring to claim 4, the transforming comprises a Two Six (TS) wavelet transform is not explicitly explained by Beck or Shapiro. However, the Applicant explains in paragraph 40 of the specification that a TS wavelet transform can be used as a discrete wavelet transform (DWT). The Applicant explains in paragraph 37 of the specification that wavelet transforms suitable for performing the DWT include the Daubechies 9-7 symmetric wavelet transform, the Two Six (TS) transform, and the Two Ten (TT) wavelet transform. Therefore, it would have been an obvious matter of design choice to modify the system of Beck and Shapiro by using a TS wavelet transform to transform a digital image into the wavelet domain, since the Applicant has not disclosed that using the TS wavelet transform solves any stated problem or is for any particular purpose and it appears that any DWT would perform equally well.

Referring to claim 5, the transforming comprises a Two Ten (TT) wavelet transform is not explicitly explained by Beck or Shapiro. However, the Applicant explains in paragraph 43 of the specification that a TT wavelet transform can be used as a discrete wavelet transform (DWT). The Applicant explains in paragraph 37 of the specification that wavelet transforms suitable for performing the DWT include the Daubechies 9-7 symmetric wavelet transform, the Two Six (TS) transform, and the Two Ten (TT) wavelet transform. Therefore, it would have been an obvious matter of design choice to modify the system of Beck and Shapiro by using a TT wavelet transform to transform a digital image into the wavelet domain, since the Applicant has not disclosed that using the TT wavelet transform solves any stated problem or is for any particular purpose and it appears that any DWT would perform equally well.

Referring to claim 6, the losslessly encoding a top LL subband comprises differential pulse coded modulator and Huffman coding is not explicitly explained by Beck or Shapiro.

However, the Applicant explains in paragraph 46 of the specification that DPCM plus Huffman coding is known to one of ordinary skill in the art to perform lossless coding. The Applicant also explains in paragraph 46 of the specification that lossless coding may be performed by DPCM plus Huffman coding, DPCM in combination with Universal source coding, DPCM and arithmetic coding, or any other suitable lossless coding method. Therefore, it would have been an obvious matter of design choice to modify the system of Beck and Shapiro by losslessly encoding a top LL by DPCM plus Huffman coding, since the Applicant has not disclosed that using DPCM plus Huffman coding solves any stated problem or is for any particular purpose and it appears that any lossless encoding method would perform equally well.

Referring to claim 7, the losslessly encoding a top LL subband comprises differential pulse coded modulator and Universal source coding is not explicitly explained by Beck or Shapiro. However, the Applicant explains in paragraph 46 of the specification that DPCM in combination with Universal source coding is known to one of ordinary skill in the art to perform lossless coding. The Applicant also explains in paragraph 46 of the specification that lossless coding may be performed by DPCM plus Huffman coding, DPCM in combination with Universal source coding, DPCM and arithmetic coding, or any other suitable lossless coding method. Therefore, it would have been an obvious matter of design choice to modify the system of Beck and Shapiro by losslessly encoding a top LL by DPCM in combination with Universal source coding, since the Applicant has not disclosed that using DPCM in combination with Universal source coding solves any stated problem or is for any particular purpose and it appears that any lossless encoding method would perform equally well.

Referring to claim 8, the losslessly encoding a top LL subband comprises differential pulse coded modulator and arithmetic coding is not explicitly explained by Beck or Shapiro. However, the Applicant explains in paragraph 46 of the specification that DPCM plus arithmetic coding is known to one of ordinary skill in the art to perform lossless coding. The Applicant also explains in paragraph 46 of the specification that lossless coding may be performed by DPCM plus Huffman coding, DPCM in combination with Universal source coding, DPCM and arithmetic coding, or any other suitable lossless coding method. Therefore, it would have been an obvious matter of design choice to modify the system of Beck and Shapiro by losslessly encoding a top LL by DPCM plus arithmetic coding, since the Applicant has not disclosed that using DPCM plus arithmetic coding solves any stated problem or is for any particular purpose and it appears that any lossless encoding method would perform equally well.

Referring to claims 13 and 17, the transforming comprising a wavelet transform selected from the group comprising a Daubechies 9-7 symmetric wavelet transform, a Two Six (TS) wavelet transform, and Two Ten (TT) wavelet transform corresponds to claims 4 or 5.

Referring to claim 14, the losslessly encoding a top LL subband comprises differential pulse coded modulator and Huffman coding corresponds to claim 6.

Referring to claim 15, the losslessly encoding a top LL subband comprises Universal source coding corresponds to claim 7.

13. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Beck in view of Shapiro, and further in view of Harris et al (U.S. Patent No. 5,450,132).

Referring to claim 10, the VQ encoding including targeted rate control is not explicitly explained by Beck or Shapiro. However, Harris et al illustrate targeted rate control according to

the size of a buffer in figure 2 and explain the rate control in column 7, lines 6-23. Harris et al explain that the rate control is performed so that the buffer is never exceeded, which is especially important in real-time video processing, in column 7, lines 24-37. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to VQ encode including targeted rate control, as suggested by Harris et al, in the video compression system of Beck and Shapiro because the buffer will never be exceeded and data will not be lost, resulting in a more accurate representation of the video signal.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hussein Akhavannik whose telephone number is (703)306-4049. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on (703)305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hussein Akhavannik

June 3, 2004 H.A.

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